



09/710,489 (S99-190)

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application No.: 09/710,489

Attorney Docket No.: S99-190

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Art Unit: 2818

Applicant: Kenneth A. Honer

Examiner: David Vu

Title: **Sputtered Silicon for Microstructures and Microcavities**

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REPLY TO SECOND NON-FINAL OFFICE ACTION

Commissioner for Patents
Washington, DC 20231

Sir:

This is in response to the second non-final Office Action mailed on August 14, 2002, and the telephonic interview with examiner David Vu on September 10, 2002. On August 19, 2002, Applicant's representative received the second Office Action, which is substantially the same as the first Office Action, with an additional secondary reference, identified as Rioux (citation omitted). Elected claims 1-24 were rejected in the second Office Action under the same primary reference, identified as Howe et al. (citation omitted), in view of Rioux, as well as other previously cited secondary references, identified as Yao and Mitchell (citations omitted). The second Office Action did not address or counter the arguments presented in the previous Reply with respect to How^e et al., Yao, and Mitchell.

In the previous Reply, Applicant's representative presented various reasons why the claimed invention would not have been obvious over How^e et al. in view of any other secondary references. Since the examiner has not rebutted the arguments against How^e et al. and How et al. is again used in the second Office Action as the primary reference under 35 U.S.C. § 103(a), it would seem that the arguments presented in the previous Reply are still valid, rendering it unnecessary to present the same arguments again in the present Reply.

Applicant's representative presented the above dilemma to the examiner's supervisor, David Nelms, on September 3, 2002. Supervisor Nelms suggested to call examiner Vu directly. Examiner Vu called back on September 4, 2002 and agreed to a telephonic interview on September 10, 2002. The present Reply is a bona fide attempt to address the examiner's concerns raised in the telephonic interview. The content of the previous Reply is herein incorporated by reference.

The essential element of Howe et al. makes it impossible to be properly combinable with any other secondary reference against the claimed invention.

Independent claims 1 and 2 and their respective dependent claims 3, 6-8, 10, 12-13, 16-17, and 23-24 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Howe et al. (U.S. Pat. No. 6,210,988, hereinafter referred to as "Howe") in view of Rioux (U.S. Pat. No. 5,554,488). Dependent claims 4-5, 9, 11, 14-16, and 18-22 again were not rejected on the merits but were again considered as containing "non-limitation". Dependent claims 7-8 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Howe in view of Rioux and further in view of Yao (U.S. Pat. No. 5,578,976). Dependent claims 23-24 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Howe in view of Rioux and further in view of Mitchell (U.S. Pat. No. 5,573,679). The rejections are respectfully traversed herein and reconsideration is hereby earnestly solicited.

Notwithstanding that Howe's structure and the claimed sputtered silicon structure are made by entirely different processes, Howe requires at least 30 percent of germanium, as pointed out in the previous Reply. Germanium is the essential element that Howe must have. Consequently, any alleged combinations involving Howe must also have germanium.

As discussed in Howe and the previous Reply, the use of poly-Si places tighter constraints on the thermal-budget allowance for the LPCVD process, due to problems associated with glass shrinkage and warpage. Further, the LPCVD process typically requires high temperature, e.g., over 650°C in Howe, and annealing temperature of above 900°C, which makes it difficult to integrate electronic circuitry that is heat resistant only up to temperatures below those required for the LPCVD process. The problem can be circumvented through the use of silicon-germanium, which can be deposited at lower temperature than silicon.

Without the essential element of germanium, there is no expectation of success in modifying
Howe.

Howe advantageously utilizes germanium to reduce deposition temperature. Howe teaches that the higher the germanium content, the lower the deposition temperature. As cited in the previous Reply, according to Howe, the minimum germanium content is about 30% [col. 5, lines 24-25]. In other words, without germanium, there is no reasonable expectation that Howe's invention would work. According to case laws cited under MPEP 2143.02, the lack of reasonable expectation of success alone negates the obviousness.

Combinations of Howe and other references including Rioux must include germanium.

The proposed combinations of Howe in view of any other secondary references, including Rioux, Yao, and Mitchell, cannot render the prior art unsatisfactory for its intended purpose. *In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984), *see, also*, MPEP 2143.02. This means that the proposed combinations of Howe in view of any other secondary references must include germanium. Since the claimed invention does not require germanium, consequently, any combinations that require germanium, as a whole, do not teach or suggest the claimed invention.

The omission of an element with retention of the element's function is an indicia of unobviousness.

As discussed in the previous Reply and in the specification, the claimed sputtered

silicon structure **does not require any germanium content** to achieve a low thermal fabrication budget where the deposition temperature is approximately between room temperature and 200°C [Spec., page 12, lines 19-30]. The omission of germanium with retention of germanium's function of reducing deposition temperature is an indicia of unobviousness. See, *In re Edge*, 359 F.2d 896, 149 USPQ 556 (CCPA-1966), see, also, MPEP 2144.04(II)(B).

Rioux specifically teaches away from the claimed invention.

Rioux does not teach or suggest how to provide a micro-machined structure that can be fabricated non-destructively to and in combination with a pre-fabricated operational circuitry such as a CMOS circuit. Rioux describes a masking layer stack comprising *non-polymeric*, heat resistant materials to allow gate metal deposition at elevated temperature by sputtering or CVD [col. 4, lines 45-47; col. 10, lines 3-43]. Rioux specifically teaches that the non-polymeric masking layer stack is advantageous for low temperature deposition where use of a polymer layer would be undesirable or incompatible for some other reason [col. 10, lines 35-43].

Contrastingly, according to the present application, the inventive utilization of low temperature sputtering techniques for depositing silicon layers makes the use of organic materials, including polyimide, for sacrificial layers possible [Spec. page 5, lines 5-10]. Polyimide is a polymeric film possessing a unique combination of physical and mechanical properties, including long life, excellent deformation and set resistance, among others. Since a prior art reference must be considered in its entirety, i.e., as a whole, including portions that would lead away from the claimed invention, it is submitted that Rioux, as a whole, does not suggest the claimed invention [MPEP 2141.02].

For the foregoing reasons, Applicant respectfully submits that Howe, Rioux and their derivative combinations, individually and in combination, do not teach or suggest the claimed sputtered silicon structure and that a *prima facie* case of obviousness has not been established. Accordingly, it is submitted that independent claims 1 and 2 and their respective dependent claims 3, 6-8, 10, 12-13, 16-17, and 23-24 respectively recite subject-matter not reached by the applicable prior art under 35 USC § 103(a) and therefore should be allowed.

Regarding claims 4-5, 9, 11, 14-15, and 18-22

These dependent claims again were not rejected on the merits. The examiner's comments and citation of case laws regarding "product by process" claims are confusing, especially in light of the fact that the elected claimed invention is directed to a silicon structure product by sputtering process. As the examiner pointed out, in "product by process" claims, it is the patentability of the final structure of the product (claims 1 and 2) "gleaned" from the process steps (claims 4-5, 9, 11, 14-15, and 18-22), which must be determined, and not the patentability of the process. In other words, patentability of dependent claims 4-5, 9, 11, 14-15, and 18-22 depend on the patentability of their base claim, which is claim 1. Dependent claims 4-5, 9, 11, 14-15, and 18-22 serve to respectively further define (limit) the claimed product and are therefore submitted to be proper and limiting. Furthermore, since claim 1 is submitted heretofore as patentable, dependent claims 4-5, 9, 11, 14-15, and 18-22 are correspondingly submitted to be patentable.

Regarding claim 1, according to case laws cited under MPEP 2112.02, when the structure recited in the reference is substantially identical to that of the claims, claimed properties or function are presumed to be inherent. This presumption is rebuttable by showing that the prior art products do not necessarily possess the characteristics of the claimed product, e.g., the composition of the prior art product is not the same as that of the claimed product.

Howe has been identified as the closest prior art of record. As discussed herein and in the previous Reply, Howe's structure requires germanium, while the claimed structure does not. One skilled in the art would have readily recognized that different compositions possess

different characteristics, thereby rebutting the presumption that Howe's structure possesses properties or function inherent to the claimed structure. Furthermore, as established in the previous and present Replies, since Howe's structure requires germanium and the claimed sputtered silicon structure is essentially free of germanium, the claimed sputtered silicon structure is a different and unobvious product from Howe [MPEP 2113].

Regarding claim interpretation

It is particularly noted that the claimed invention as a whole must be considered. Distilling an invention down to the "gist" or "thrust" of an invention disregards the statutory requirement of analyzing the subject matter "as a whole." *W.L. Gore & Associates, Inc. v. Garlock, Inc.*, 721 F.2d 1540 (citation omitted), *see, also*, MPEP 2141.02. During the telephonic interview, the examiner contended that the primary reference, Howe, reads on the claimed invention despite Howe's explicit lack of teaching of sputtering process to achieve a low thermal fabrication budget. The reason given was that the claimed thermal fabrication budget of the sputtered silicon structure, which must be smaller than the critical thermal budget of the underlying operational circuitry, is not considered as part of the product structure. Such interpretation improperly limited the focus to a structural difference from the prior art and failed to consider the invention as a whole. *Schenck v. Nortron Corp.*, 713 F.2d 782 (citation omitted), *see, also*, MPEP 2141.02. To establish a *prima facie* case of obviousness, three basic criteria must be met, including that the prior art reference (or references when combined) must teach or suggest all the claim limitations. *In re Vaack*, 947 F.2d 488 (citation omitted), *see, also*, MPEP 2142, 2143-2143.03. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure. *Id.*

Conclusion

For the foregoing reasons, Applicant respectfully submits that claims 1-24 recite subject matter not reached by the closest prior art of record under applicable laws and therefore should be allowed. Since the examiner has done a thorough search in the previous

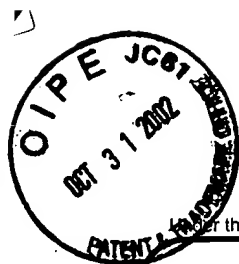
actions in light of the entire application disclosure and claims, no new search would be necessary. Accordingly, Applicant respectfully submits that the present application is in a condition for allowance. Favorable consideration and a Notice of Allowance of all the claims are therefore earnestly solicited. The examiner is invited to telephone the undersigned at (408) 5 260-7300 extension 23 for discussing an Examiner's Amendments or other suggested actions. _____
for accelerating prosecution and moving the present application to allowance.

Respectfully submitted,



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ENCLOSURES (check all that apply)

☐ Fee Transmittal Form

☐ Fee Attached

☒ Amendment / Reply

☐ After Final

☐ Affidavits/declaration(s)

☐ Extension of Time Request

☐ Express Abandonment Request

☐ Information Disclosure Statement

☐ Certified Copy of Priority Document(s)

☐ Response to Missing Parts/ Incomplete Application

☐ Response to Missing Parts under 37 CFR 1.52 or 1.53

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